# August Exam 2018

August 1, 2018

International Economics

## Problem 1

Answer whether each statement is true, false or uncertain. Defend your answer! Answers without comments can at most get half points.

1.1. Within the Ricardian trade model, an absolute advantage in the production of a given good is neither necessary nor sufficient for a country to have a comparative advantage in producing the same good.

> True. It is not a sufficient condition because a country might have a small absolute advantage in the given good but a large one for another good. Furthermore, it is not necessary because a country with a lack of an absolute advantage in everything will still have a comparative advantage in at least one good.

1.2 Domestic market failures may be used as an argument against free trade.

> True. Marginal social benets may not be captured by producer surplus, and so a government intervention that appears to distort incentives in one market may increase welfare by offsetting the consequence of market failures elsewhere. A specific example is also a good response.

1.3 Everyone gains from international labor mobility.

> False. Labor moves from countries where it is abundant to countries where it is scarce until wages are equalized. This raises total world output, but it also generates strong income distribution effects, so that some groups are hurt.

1.4. Consider one country which trades costlessly with the rest of the world and is described by the two-factor model with capital and labor. Keep the world price fixed. Suppose there is a positive immigration inflow but that these immigrants are wealthy and bring with them more capital per person than the native population. This will increase production of the capital-intensive good but keep the wage and return on capital constant.

True: This is the Rybczynski theorem, but due to the fact that immigrants are bringing in a lot of capital the capital / labor ratio will increase. This will increase the production of the capital-intensive good as stated but factor price equalization will keep wages and return on capital constant.

1.5. Consider the Dornbusch/Fisher/Samuelson model of continuous goods and two countries. Suppose there is an increase in population abroad. This will benefit home.

True. The increase in population will be accomodated by a relative wage rise in home which will increase home utility.

1.6. Imposing an import quota or imposing and import tariff are equivalent when markets are competitive and the home government sells the quota (and gets the revenue).

True: Two reasons why import quotas might be worse is when there is market power or when the home government lets foreign governments get the revenue.

1.7 The most favored nation (MFN) principle states that all countries who are members of the GATT/WTO should be treated equally with respect to tariffs.

Almost. It does allow exceptions for Currency Unions and Free Trade areas.

## Problem 2

Consider a Dornbusch, Fischer and Samuelson model with the following characteristics:

There are two countries, Home and Foreign, with respective quantities of labor of $L$ and $L^*$. There is a continuous set of good on the unit interval ($z \in [0, 1]$) and the representative agents in both home and foreign have identical Cobb-Douglas utility over these inputs:

$$u = exp(\int_0^1 logc(z)dz).$$

The function $a(z)$ determines how many units of labor home need to produce one unit of $z$ and $a^*(z)$ how much labor foreign needs. Let $A(z) \equiv a^*(z)/a(z)$ and assume that $A'(z) < 0$.

a) Argue that the cost of a good must be the same in both countries and equal to:

$$p(z) = p(z^*) = min\left\{wa(z), w^*a^*(z)\right\},$$

where $p(z)$ is the cost of a good in home, $p(z^*)$ is the cost of a good in foreign and $w$ and $w^*$ are the respective wages in the two countries.

*Answer: This is just the cost-minimizing price. Formally, start out by noting that perfect compeitition and no trade impediments require $p(z) = p^*(z)$. Then the maximization problem of choosing quantity $q$ so as to maximize in foreign is:*

$$max_q p(z)q - w^*a^*(z)q$$

*which gives a first order condition of positive $q$ if*

$$p(z) = w^*a^*(z).$$

*and zero if:*

$$p(z) < w^*a^*(z).$$

*Equivalently for home where we have positive $q$ for:*

$$p(z) = a(z)w$$

*and $q = 0$ for:*

$$p(z) < w.$$

*Consequently production will take place in home or foreign depending on $min\{wa(z), w^*a^*(z)\}$.*

b) Let there be a product $z'$ which the two can produce at equal costs. Argue that it is given by $wa(z') = w^*a^*(z')$ and argue that $A'(z) < 0$ is a sufficient condition to ensure that home produces $z \leq z'$ and foreign produces $z > z'$.

*Answer: The product that is equally cheap to produce in both countries must have same cost of production $wa(z') = w^*a^*(z')$ or equivalently:*

$$wa(z') = w^*a^*(z')$$

*For home to be able to produce $z < z'$ cheaper it must be the case that for all $z < z'$*

$$wa(z) < w^*a^*(z) \Leftrightarrow$$
$$\frac{w}{w^*} < A(z)$$

*but since $w/w^* = A(z')$ by the definition of $z'$ we get:*

$$A(z') < A(z),$$

*which is so because $A'(z) < 0$.*

c) Show that with balanced trade the following condition must hold:

$$\frac{w}{w^*} = \frac{z'}{1 - z'} \frac{L^*}{L}.$$

This implies that $w/w^*$ is increasing in $z'$. Why? Interpret

*Answer: The Cobb-Douglas utility function ensures that total world spending on goods from home will be:*

$$z'(wL + w^*L^*),$$

*because total world income is $wL + w^*L^*$ and Cobb-douglas ensures a constant share of income is spend on each good. This must equal total income in home which can only go to labor, such that:*

$$wL = z'(wL + w^*L^*) \Leftrightarrow$$

$$\frac{w}{w^*}\frac{L}{L^*} = \frac{z'}{1-z'}.$$

d) Show - either graphically or mathematically - that an increase in foreign population, $L^*$, raises the relative wage $(w/w^*)$ of home workers.

*Answer: The equilibrium of the model is given by two expressions:*

$$\frac{w}{w^*} = \frac{z'}{1-z'}\frac{L^*}{L}$$

$$\frac{w}{w^*} = A(z'),$$

*which determines the endogenous variables, $w/w^*$ and $z'$, as a function of exogenous variables. Solve for $z'$ and differentiate wrt $L^*$ to get:*

$$A(z') = \frac{z'}{1-z'}\frac{L^*}{L},$$

*which implies:*

$$A'(z')\frac{\partial z'}{\partial L^*} = \frac{1}{(1-z')^2}\frac{L^*}{L}\frac{\partial z'}{\partial L} + \frac{z'}{1-z'}\frac{1}{L} \Leftrightarrow$$

$$\frac{\partial z'}{\partial L^*} = \frac{\frac{z'}{1-z'}\frac{1}{L}}{A'(z') - \frac{1}{(1-z')^2}\frac{L^*}{L}} < 0.$$

*And since $A'(z)$ it follows directly from $w/w^* = A(z')$ that:*

$$\frac{\partial(w/w^*)}{\partial L^*} > 0,$$

*such that the relative wage of home workers increases.*

e) Show that home utility is given by:

$$U = -\int_0^{z'} log(a(z))dz - \int_{z'}^1 log(a(z)\frac{w^*}{w})dz.$$

*Answer: The utility function for a given home worker is given by:*

$$U = \int_0^{z'} log(c(z))dz + \int_{z'}^1 log(c(z))dz.$$

*The spending of a home worker on a good produced at home ($z < z'$) is $w$ and the price is $a(z)w$ such that units consumed is:*

$$\frac{w}{wa(z)} = a(z)^{-1}.$$

*The spending of a home worker on a good produced in foreign ($z > z'$) is also $w$ and with a price of $a^*(z)w^*$ the units consumed are:*

$$\frac{w}{w^*a^*(z)} = \frac{w}{w^*}a^*(z)^{-1}.$$

*implying that utility as a function of $z'$ and $w/w^*$ is:*

$$U = -\int_0^{z'} log(a(z))dz - \int_{z'}^{1} log(a^*(z)\frac{w^*}{w})dz.$$

f) Show that home utility is increasing in $L^*$.
*Answer: We just found that $\partial(w/w^*)/\partial L^* > 0$ and $\partial z'/\partial L^* < 0$. Since:*

$$\frac{\partial U}{\partial z'} = -log(a(z')) + log(a^*(z')\frac{w^*}{w}) = 0$$

$$\frac{\partial U}{\partial (w/w^*)} = \frac{(1-z')}{w/w^*} > 0,$$

*we conclude that $dU/dL^* > 0$.*

g) Foreign country considers introducing a gross tariff of $\tau > 1$ such that the government charges $(\tau - 1)p$ for the import of a unit of good with a price $p$. The entire tariff revenue will be paid out to the workers lump sum. For simplicity consider a marginal tariff, i.e. consider $\tau = 1$ (no tariff) and derive the (sign of) the effect on home utility from a marginal increase. Further, assume in the following that $L = L^* = 1$ and that:

$$A(z) = \frac{1}{2z}.$$

Show that the equilibrium is characterized by $(z^a, z^b, w/w^*)$ where $[0, z^a]$ products are produced at home $[z^a, z^b]$ products are produced in both countries and products $[z^b, 1]$ are produced in foreign. Show that the equilibrium wage is given by:

$$(2\frac{w}{w^*} - 1) = 2\frac{1}{2\tau^2\frac{w}{w^*} - \tau + 1},$$

and that this implies:

$$\frac{d\,(w/w^*)}{d\tau}|_{\tau=1} = -\frac{1}{2},$$

$$\frac{dz^a}{d\tau}|_{\tau=1} = -\frac{1}{4}.$$

$$\frac{dz^b}{d\tau}|_{\tau=1} = \frac{1}{4},$$

and that this implies unequivocally that foreign benefits and home loses from foreign imposing a (small) tariff.

*Answer: The tariff will introduce two cut-offs: $z^a$ and $z^b$ where $z^b$ is given as the cut-off where home will import from foreign:*

$$wa(z^b) = w^* a^*(z^b) \Leftrightarrow$$

$$\frac{w}{w^*} = A(z^b) = \frac{1}{2z^b}.$$

*Further, $z^a$ gives the condition for which foreign will import from home:*

$$wa(z^a)\tau = w^* a^*(z^a) \Leftrightarrow$$

$$\frac{w}{w^*}\tau = \frac{1}{2z^a}.$$

*which are obviously identical if $\tau = 1$. If $\tau > 1$ we have $z^a < z^b$. Hence, there will be a set of products $[z^a, z^b]$ which are produced in both countries and not traded. All products $z < z^a$ will be solely produced in home and all products $z > z^b$ will be solely produced in foreign.*

*Total income in home is given by $w$ of which $z^b$ is spend on home products. Consequently, total spending on home goods by home is*

$$z^b w$$

*Let total income in foreign be $I^*$. This consists of income of workers $w^*$ plus tariff revenue of all spending on home goods: $\frac{(\tau-1)}{\tau} z^a I^*$ such that:*

$$I^* = w^* + \frac{(\tau - 1)}{\tau} z^a I^* \Leftrightarrow$$

$$I^* = \frac{w^* L^*}{1 - z^a + z^a/\tau},$$

*of which $z^a$ is spent on home goods. Consequently total spending on home goods net of tariff payments is:*

$$wL = z^b wL + \frac{z^a}{\tau} \frac{w^* L^*}{1 - z^a + z^a/\tau},$$

*such that:*

$$\frac{w}{w^*} = \frac{1}{1 - z^b} \frac{z^a/\tau}{1 - z^a + z^a/\tau} \frac{L^*}{L},$$

*or equivalently:*

$$\frac{w}{w^*} = \frac{1/z^b}{1/z^b - 1} \frac{1}{\tau/z^a - \tau + 1} \frac{L^*}{L}.$$

*Use the definition of $z^a$ and $z^b$ to find:*

$$(2\frac{w}{w^*} - 1) = 2\frac{1}{2\tau^2\frac{w}{w^*} - \tau + 1},$$

*as desired.*

*Differentiating this expression gives the three derivatives required.*

*To show that home loses write the expression analogous to question e) and show that only the term $d(w/w^*)/d\tau$ matters and consequently the welfare effect is negative for home (an analogously positive for foreign).*